PROPOSAL NUMBER: 99- 418

CURRICULUM PROPOSAL FORM

*DEADLINES:
REGULAR COURSE PROPOSALS: OCTOBER 23, 1998 FOR FALL, 1999 AND FEBRUARY 19, 1999 FOR SPRING, 2000
SHORT-TERM COURSE PROPOSALS: DECEMBER 11, 1998 FOR FALL, 1999 AND MARCH 26, 1998 FOR SPRING 2000

PROPOSAL TITLE: Advanced Heat and Mass Transfer

SPONSOR/S: John C Chen, Associate Provost

DEPARTMENT: Mechanical Engineering 0910. 413

CHECK ALL THAT APPLY:
__✓__ UNDERGRADUATE _____ GRADUATE

COLLEGE: Engineering

If LAS:
_____ History/Humanities
_____ Math/Sciences
_____ Social/Behavioral Sciences

* * * * * * * * * * *

TYPE OF PROPOSAL *(Check ALL that Apply)*

_____ General Education
- _____ *New Course in* _____ *Bank*
- _____ *Existing course, Add To* _____ *Bank*
- _____ *Multicultural/Global Designation*
- _____ *Writing Intensive Designation*

_____ New Minor/Concentration/Specialization
_____ New Major/Degree Program
Short Term Course Proposal

_____ New Course (NOT Gen. Ed.)
_____ Name Change (Dept., School, Major)
_____ Changes in Degree Requirements
- _____ *Changes Involve Gen. Ed. requirements*

_____ Minor Changes to Existing Courses
- _____ *Course is NOT General Education*
- _____ *Course IS General Education*

DEPARTMENT
(SIGNATURE INDICATES APPROVAL)

[signature] 10/22/98 — [signature] 10/22/98
DEPT. CURRICULUM CHAIR / DATE — DEPT. CHAIRPERSON / DATE

COLLEGE CURRICULUM COMMITTEE
DATE OF OPEN HEARING (if necessary)_____
✓ APPROVED
— NOT APPROVED
COMMENTS:

[signature] 2/10/99
SIGNATURE — DATE

ACADEMIC DEAN (& GRADUATE DEAN, for New Graduate Programs Only)
✓ — APPROVED
— NOT APPROVED
COMMENTS:

[signature] 10/23/98
SIGNATURE (Academic Dean) — DATE

SIGNATURE (Graduate Dean) — DATE

UNIVERSITY CURRICULUM COMMITTEE

DATE OF OPEN HEARING (if necessary) 2/16/99 (college level only)

✓ APPROVED

— NOT APPROVED

COMMENTS:

Pamela Rivera 4/1/99

SIGNATURE **DATE**

SENATE

Date announced at Senate 2/23/99

Voted upon at Senate: **Approved** **Not Approved** **Date:**

EXECUTIVE VICE PRESIDENT/PROVOST

_____**APPROVED**

_____**NOT APPROVED If no, reasons are as follows:**

STUDENT CREDIT HOURS _____ **FACULTY LOAD HOURS** _____ **EQUALIZED CREDIT HOURS** _____

OFFICIAL COPY & APPROVAL SHEET FILED (DATE): ____

DATE/SIGNATURE EXECUTIVE VICE PRESIDENT/PROVOST

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED _____

HEGIS TAXONOMY & COURSE NUMBER ASSIGNED 0910.413

DATE/SIGNATURE OF REGISTRAR Robert A. Kulat 4/6/99

NOTIFICATION FORWARD:

_____**SENATE CURRICULUM COMMITTEE CHAIRPERSON**

__✓__**DEPARTMENT CHAIRPERSONS**

__✓__**ACADEMIC DEAN(S)** TM 4/22/99

__✓__**REGISTRAR**

_____**SPONSOR(S)**

Course Proposal

1. Details:

a) Course Title:	Advanced Heat and Mass Transfer (0910-413)
b) Sponsor:	Dr. John C. Chen, Department of Mechanical Engineering, College of Engineering
c) Credit Hours:	3 credit hours
d) Course Level:	Senior
e) Curricular Effect:	A senior elective for Mechanical Engineering majors. May also be taken by Chemical Engineering majors as a Technical Elective.
f) Prerequisites:	Engineering Thermodynamics II (910.312) and Transfer Processes I (906.311), or equivalent courses.
g) Suggested Time/ Scale of Implementation	Fall 1999 One section
h) Resources:	Faculty is in place to teach the course within the Dept. of Mechanical Engineering. A 1130 square foot thermo and engine laboratory will be available to support this course. Various laboratory-scale demonstration experiments have already been purchased in support of this course. Library resources are in place. Computer hardware resources are available in the Engineering Building to support this course. A license for Engineering Equation Solver, a heat and mass transfer analysis software, has been purchased to support this course.

2. Rationale:

The proposed course is part of the Engineering Curriculum Proposal approved by the University Senate in December 1994. The proposed course is consistent with the establishment of the College of Engineering approved by the Board of Trustees in February 1995. The curriculum for the Department of Mechanical Engineering consists of two major focuses: Mechanical Systems and Thermal/Energy Systems. Advanced Heat Transfer is an important elective for those wishing to focus on the thermal/energy systems track.

The topics covered in this course extend and complement the Transfer Processes I course, required for all undergraduate mechanical and chemical engineering students. While Transfer Processes I provides an overview and introduction to the engineering fundamentals of heat transfer, Advanced Heat Transfer will provide the students with a deeper knowledge of heat transfer principles, and will allow more rigorous and open-ended problems to be examined. Compared to Transfer Processes I, the proposed course will require more problem solution by computational methods, and will also include two additional topics, radiation and mass transfer. Students successfully completing this course will be able to solve a wider range of heat and mass transfer problems encountered in industry.

3. Essence of the Course:

a) Objectives:

Advanced Heat Transfer complements and extends the required course, Transfer Processes I. Upon completion of this course, the undergraduate student will be able to

1. Model practical conduction, convection and radiation heat transfer problems, and derive appropriate differential equations that describe the physics.
2. Solve one-, two-, and three-dimensional, steady and non-steady conduction problems using analytical and computational methods.
3. Derive appropriate equations that govern convective heat transfer situations, and solve them using analytical and computational methods.
4. Model radiation heat transfer problems, and analytically predict the heat flux and temperature fields that prevail.
5. Solve problems involving multiple modes of heat transfer.

b) Topical Outline:

The topical outline of the course is as follows, though some variation may exist due to the emphasis placed on each topic by different instructors. The topics to be covered will include the following:

Conduction
- One-, two-, and three-dimensional, steady-state
- One-, two-, and three-dimensional, non-steady-state

Convection
- External Flow
- Internal Flow
- Free Convection

Radiation
- Radiation concepts
- Blackbody radiation
- Optical properties of materials
- Radiation exchange between bodies

Mass Transfer
- Boiling
- Condensation

c) Evaluation and Grading Procedure of Students:
Student grades will be determined on the basis of examinations, homework and/or projects, laboratory projects and reports.

d) Course Evaluation:
The proposed course will be evaluated on the basis of student evaluations and curriculum review by appropriate faculty.

4. Results of Consultations:
The proposed course is part of the Engineering Curriculum Proposal approved by the Faculty Senate in December 1994. Consultations were submitted with original proposal as specified by the Curriculum Committee. Additional curriculum consultations were performed with outside consultants including, Professor Skip Fletcher of Texas, A&M. Professor Fletcher is a fellow of the American Society of Mechanical Engineers.

Catalog Description:

Advanced Heat Transfer (0910.413)
Prerequisites: *Engineering Thermodynamics II (910.312) and Transfer Processes I (906.311), or equivalent.*

The topics covered in this course extend and complement the Transfer Processes I course. While Transfer Processes I provides an overview and introduction to the engineering fundamentals of heat transfer, Advanced Heat Transfer will provide a deeper knowledge of heat transfer principles, and will allow more rigorous and open-ended problems to be examined. The course will include two additional topics, radiation and mass transfer. Students successfully completing this course will be able to solve a wider range of heat and mass transfer problems encountered in industry.